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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/711,918	10/13/2004	Jeffrey A. Tarvin	101.0166	5917

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SCHLUMBERGER TECHNOLOGY CORPORATION
14910 AIRLINE ROAD
ROSHARON, TX 77583

EXAMINER	
DITRANI, ANGELA M	
ART UNIT	**PAPER NUMBER**
3676	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/711,918	TARVIN ET AL.	
	Examiner	**Art Unit**	
	Angela M. DiTrani	3676	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 June 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 12-15 are objected to because of the following informalities:

Claims 12-15 each recite the limitation of "wherein obtaining comprises." Claim 1, from which each of claims 12-15 depends, was amended such that "obtaining" was replaced by "to obtain." Revision of claim 12 to read –wherein a distributed temperature sensor is used to obtain the temperature profile data along a portion of a wellbore-; claim 13 to –wherein an optical fiber is deployed in the wellbore to obtain the temperature profile data in the wellbore-; etc. is suggested. Appropriate correction is required.

2. Claim 12 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 1, as amended now recites the limitation of "using a distributed temperature sensor system." Therefore, the limitation of "The method as recited in claim 1, wherein obtaining comprises utilizing a distributed temperature sensor" fails to further limit the subject matter of claim 1.

3. Claim 42 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 31 recites the limitation of "processing the data to detect specific events related to heat energy in the

well." Therefore, the limitation of "detecting particular temperature signals corresponding to a particular downhole event" fails to further limit the subject matter of claim 31.

Claim Rejections - 35 USC § 102

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1-9, 11-14, 16-39, and 42-48 are rejected under 35 U.S.C. 102(b) as being anticipated by C.K. Woodrow (SPE/IADC 67729 – cited by applicant on IDS filed 01/24/05).

With respect to claim 1, Woodrow discloses a method for analyzing distributed temperature data from a well, comprising: using a distributed temperature sensor system to obtain temperature profile data along a portion of a wellbore; providing the temperature profile data to a processor; automatically determining whether fluids are flowing into or out of a tubing located in the well by processing the temperature profile data; and highlighting valuable information to a user related to the flow of fluid relative to the tubing (see entire document, especially sections **Principle of Operation**, and **How it was deployed in Term Alpha Well A-27**).

With respect to depending claims 2-9, the reference teaches automatically processing comprising, removing noise from the temperature profile, removing low order spatial trends, utilizing a high-pass filter, utilizing a low pass filter, and applying a model-fitting algorithm, wherein applying a model-fitting algorithm comprises selecting regions for fitting and fitting a model to data, further comprising testing results for statistical

significance, and constructing a match filter using extrema of a convolution of the filter with data to select candidate depths (see entire document, especially sections **Principle of Operation**, **How it was deployed in Term Alpha Well A-27,** and **Future plans**).

With respect to depending claim 11, the reference teaches trend removal and filtering of the temperature profile data (see sections **Observed thermal profile during well kick-off**, **Observed thermal profile as a water injector**, and **Observed non-linearity of the static thermal profile**).

With respect to depending claims 12 and 13, the reference teaches obtaining temperature data using a distributed temperature sensor and deploying an optical fiber in the wellbore (see **Principle of Operation**).

With respect to depending claim 14, the reference teaches a temporary distributed temperature installation (see p. 2, lines 5-14, wherein the North Sea sub-surface safety valve installation is disclosed to preclude permanent deployment of the fibre).

With respect to depending claim 16, the reference teaches utilizing a match filter (see **Observed thermal profile during well kick-off**).

With respect to depending claims 17-20, the reference teaches the match filter detecting particular temperature signals corresponding to a particular downhole event, including location of a gas lift valve, the hole in a tubing, and a leak in a wellbore completion tool (see **How it was deployed in Term Alpha Well A-27**).

With respect to depending claim 21, the reference teaches automatically processing occurring in real-time (see **Principle of Operation**).

With respect to independent claim 22, Woodrow discloses a system to analyze distributed temperature data from a well, comprising: a distributed temperature sensor adapted to measure temperature profile data along a portion of a wellbore; a processor adapted to receive temperature profile data, the processor being programmed to identify a particular temperature signal that corresponds to a specific downhole event having an inflow of relatively cooler fluid; and wherein the processor outputs valuable information related to the specific downhole event to a user (see entire document).

With respect to depending claims 23-29, the reference teaches the distributed temperature system comprises an optical fiber, an opto-electronic unit to launch optical pulses downhole, wherein the unit is coupled to the processor by a communication link, wherein the communication link is a hardline link, or a wireless link, and wherein the processor is embodied in a portable computer, and a production tubing deployed in the wellbore with the optical fiber, wherein the tubing is combined with a gas lift system (see **Abstract, Principles of Operation, How it was deployed in Term Alpha Well A-27**).

With respect to claim 31, Woodrow discloses a method of detecting certain events within a well, comprising: using a distributed temperature sensor system to obtain data related to temperature over a period of time along a portion of a wellbore; automatically processing the data to detect specific events related to heat energy in the well; and displaying results to a user (see entire document).

With respect to depending claims 34-39, the reference teaches automatically processing the data on a processor-based computer, processing backscattered light signals, applying a model-fitting algorithm to the data, selecting regions for fitting and

fitting a model to data, testing for statistical significance, and constructing a match filter using extrema of convolution of the filter with data to select candidate depths (see entire document).

With respect to depending claims 42-45, the reference teaches detecting particular temperature signals corresponding to a particular downhole event, location of a gas lift valve, a wellbore completion tool leak, and a hole in a production tubing (see **How it was deployed in Tern Alpha Well A-27**).

With respect to depending claim 46, the reference teaches displaying results in graphical form (see **Observed thermal profile during well kick-off**, **Observed thermal profile as a water injector**, and **Observed non-linearity of the static thermal profile**).

With respect to depending claim 47, the reference teaches utilizing a match filter (see entire document).

With respect to depending claim 48, the reference teaches automatically processing in real-time (see **Principles of Operation**).

Claim Rejections - 35 USC § 103

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. Claims 10 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodrow (SPE/IADC 67729) in view of Riza (US 6,360,037).

With respect to claim 10, Woodrow discloses the method for analyzing distributed

temperature data from a well as indicated with respect to claim 1 above. The reference further discloses future plans of additional thermal modeling study work (see **Future plans**) wherein a thermal model that can accurately match the observed temperature profile may be established (see **Observed thermal profile during well kick-off**). However, the reference fails to explicitly teach constructing a match filter comprising incorporating modifications to the filter to make it orthogonal to background trends, as claimed. Riza teaches a polarization-based fiber-optic switch wherein an active noise filter is formed by an active polarization rotation element and a polarizer at the output of the system; the technique of such a filter is based on the fact that the polarization of the leakage noise coming from he undesired input-port which has leaked through passive noise filter is always orthogonal compared to the polarization signal; for the purpose of suppressing the noise (see col. 7, lines 24-42). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct a match filter in which modifications are made to the filter to make it orthogonal to background trends within the fiber-optic system of Woodrow in order to suppress noise within the data and thereby establish a more accurate model to match the observed temperature profile.

With respect to claim 40, Woodrow discloses the method of detecting certain events within a well as indicated with respect to claim 31 above. The reference further discloses future plans of additional thermal modeling study work (see **Future plans**) wherein a thermal model that can accurately match the observed temperature profile may be established (see **Observed thermal profile during well kick-off**). However,

the reference fails to explicitly teach constructing a match filter comprising incorporating modifications to the filter to make it orthogonal to background trends, as claimed. Riza teaches a polarization-based fiber-optic switch wherein an active noise filter is formed by an active polarization rotation element and a polarizer at the output of the system; the technique of such a filter is based on the fact that the polarization of the leakage noise coming from he undesired input-port which has leaked through passive noise filter is always orthogonal compared to the polarization signal; for the purpose of suppressing the noise (see col. 7, lines 24-42). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct a match filter in which modifications are made to the filter to make it orthogonal to background trends within the fiber-optic system of Woodrow in order to suppress noise within the data and thereby establish a more accurate model to match the observed temperature profile.

8. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Woodrow.

With respect to claim 15, Woodrow discloses the method as stated above wherein the deployment method for the optical fibre distributed temperature system can be within the control line, externally on the outside of tubing, or run in and out of the well using typical wireline techniques (see **Principle of Operation**). The aforementioned section fails to explicitly disclose the wireline technique wherein the temperature profile data is obtained with a slickline distributed temperature sensing system.. Woodrow, however, teaches prior art temperature measuring techniques wherein temperature is measured using production logging tools, run on slickline or electric line, and/or coiled

tubing, for the purpose of continuously monitoring the wellhead temperature (see **Background**). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to deploy the optical fibre distributed temperature system using a "typical" wireline technique such as a slickline for the purpose of continuously obtaining temperature data.

9. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Woodrow (SPE/IADC 67729) in view of Tubel (US 6,012,015).

Woodrow discloses the method with respect to claim 31 as stated above. However, the reference fails to teach automatically processing comprising applying a phenomenological model to the data. Tubel teaches a downhole production well control system in which sensors are employed, and, wherein models, such as phenomenological models, are employed for the purpose of combining knowledge obtained from the system with a model for the purpose of obtaining optimum operating parameters for the process and improving the performance therein (see col. 6, lines 25-57). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to look to a phenomenological model to provide quantitative interpretations within the future plans of the method of Woodrow in order to improve upon the modeling process therein.

Response to Arguments

10. Applicant's arguments with respect to claims 1-48 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

The Use of Distributed Well Temperature Measurements in Waterflood Management: The reference discloses fibre optic sensor technology wherein optical fibres can provide distributed real time temperature data at one metre resolution within a production well. Analytic calculations are made and "fingerprints" reflecting reservoir characteristics are created. This information is considered pertinent to applicant's disclosure and present claims and should therefore be given consideration by applicant.

US 7,055,604: Jee et al. discloses a method for treating a subterranean formation wherein distributed temperature sensors are provided and the temperature across the treatment interval is monitored.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Angela M. DiTrani whose telephone number is (571) 272-2182. The examiner can normally be reached on M-F, 6:30AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer Gay can be reached on (571)272-7029. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AD
08/21/07

JENNIFER H. GAY
SUPERVISORY PATENT EXAMINER